調査

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わかっていること

・実射影平面のように、裏表のない閉曲面を 3 角形に分割して得られる単体複体 K の 2 次のホモロジー群は、$\mathbb{Z}$ と同型にはならない Ref[1]。

・topological codes are highly degenerate, which means that the minimum distance is much higher than the weight of the stabilizers. Though the thresholds of topological codes are relatively high, their dimensions are usually much smaller than for general QLDPC codes of the same length (it is constant for the surface and color codes).

・Asymptotically good constructions may not necessarily produce the best QLDPC codes for relatively small code lengths. Indeed, in the construction of hypergraph product codes was further improved and generalized. Although the asymptotic characteristics of the improved codes are the same as before, their parameters such as the rate and he minimum distance are much better for smaller lengths.

・The sparseness usually means that the weights of all rows and columns in H are upper boudned by some universal constant as the code length n grows in an infinite family of codes.

・It was observed that LDPC codes without 4-cycles perform very well in practice. →問題 1 へ

・fiber bundle code は generalized hypergraph product code に対応させることができる Ref[3]。

問題

・that practical observation is not fully investigated from theoretical point of view.

・the minimum distance of generalized hypergraph product is not found. Ref[2]

・non-abelian lift product codes is not studied.

思考

・How can we difine a code distance in bicycle codes? Ref[2]

REFERENCES

[1] 枡田 幹也 , 代数的トポロジー

[2] Pavel Panteleev and Gleb Kalachev ,Degenerate Quantum LDPC Codes With Good Finite Length Performance, arXiv:1904.02703v3

[3] Pavel Panteleev and Gleb Kalachev, Quantum LDPC Codes with Almost Linear Minimum Distance, arXiv:2012.04068v2

要調査

・超伝導やシリコンスピンで取り除かなければならない異質とは何か
・中性原子の parasitic charge とは
・中性原子の配列をグラフ理論の点に対応させることで問題を解ける
・中性原子の量子ビット再配列方法
・analog simulation の可能性
・nFT state preparation
・feedforward と mid-circuit measurement の違い
・Instataneous Quantum Polynomial
・braiding で d 以上動かすとどうなるのか
・easy intialization と difficult intialization はどっちがいいのか
・toric code in magnetic field(ising model)
・bacon-shor code
・neutral adn traped ion approaches rely on light scattering for entropy removal
・中性原子の measurement free な protocol
・Sisyphus cooling
・magic intensity, magic-wavelenghth tweezers
・spin echo pulse, magic trapping
・code distance の求め方
・LDPC code では、あんまり冗長性がありすぎてもいけない